

CANYON CREEK FIRE VEGETATION STUDY

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INTRODUCTION

The Canyon Creek Fire started on June 25, 1988 from a lightning strike. Since it was within the Scapegoat Wilderness natural prescribed fire plan area and met prescription guidelines it was managed as a prescribed natural fire until August 30, 1988 when it went out of prescription and was declared a wildfire. A major wind event on September 6 and 7 drove the fire eastward resulting in an increase in size from about 60,000 acres to 248,000 acres in 16 hours. Steady rain and snow finally arrived on September 10 and the fire was declared contained on September 18. Not only was this fire one of the largest in recent history but it also was permitted to burn much of its life as a natural event. Burn intensity varied widely and a mosaic of burn patterns resulted. During the first week of October, 1988 12 vegetation plots were established in the Lolo Forest portion of the burn along with 23 camera points to track the vegetative recovery of the burn. Two additional vegetation plots were established during the summer of 1989. Data collected from these plots in the subsequent years provide the basis for this report.

FIRE AREA

Location

The Lolo Forest portion of the fire is located primarily in the North Fork of the Blackfoot River and its principle drainages including Lake, Cabin, Canyon and Dry Fork Creeks. Most of the Lolo Forest portion of the burn is in the Scapegoat Wilderness with approximately 75 percent of the Wilderness burned by the fire.

Geology and Soils

This portion of the Lolo Forest has been glaciated and soils have developed on glaciated uplands or on glacial valley trains or alluvial deposits. The bedrock consists of weakly weathered metasedimentary rocks of the Belts supergroup quartzites, siltites, and argillites. Most soils have developed in volcanic ash influenced loess overlying metasedimentary rock. (Holdorf 1990)

Climate

Most of the Lolo Forest is under the influence of the Pacific coast maritime climate, however close to the Continental Divide the climate approaches a more continental influence. This tends to produce drier and colder conditions. Precipitation at Seeley Lake averages about 23 inches a year. The March, April period is the driest part of the year followed by July, August and October. The three wettest months are May, June and September based on 1981 to 1985 data.

Vegetation

Habitat types as defined by Pfister et al (1977) were used to classify the vegetation. Most of the fire area is dominated by habitat types in the subalpine fir series with subalpine fir/beargrass (*Abies lasiocarpa/Xerophyllum tenax*) the most common type. North slopes generally contain subalpine fir/menziesia (*Abies lasiocarpa/Menziesia ferruginea*). Slopes above 6600 feet in elevation are commonly covered by subalpine fir/woodrush (*Abies lasiocarpa/Luzula hitchcockii*) or whitebark pine/subalpine fir (*Pinus albicaulis-Abies lasiocarpa*) habitat types. Bunchgrass types are common in the Evans Peak – Carmichael Cabin area on upper south facing slopes. Scree and talus slopes dominate the North Fork Canyon below the North Fork cabin. Minor amounts of subalpine fir/bluejoint reedgrass (*Abies lasiocarpa/Calamagrostis canadensis*) or spruce/common horsetail (*Picea/Equisetum arvense*) can be found along many of the streams. Only minor amounts of the Douglas-fir (*Pseudotsuga menziesii*) series are found in the fire area with Douglas-fir/pinegrass (*Pseudotsuga menziesii/Calamagrostis rubescens*) the most common type.

Cover types are dominated by lodgepole pine (*Pinus contorta*) with mixtures of subalpine fir, spruce and lodgepole pine on the moister sites. Stream bottoms commonly contain significant amounts of spruce along with subalpine fir. Minor areas of warmer-drier sites are dominated by Douglas-fir with some larch (*Larix occidentalis*) in the North Fork Drainage on the perimeter of the Wilderness. Whitebark pine is common in stands above 7000 feet. Alpine vegetation can be found on the Scapegoat Plateau above 8000 feet.

TABLE 1 Land type and habitat type for study plots

Plot No.	Land Type	Habitat Type
1	72OA Gently rolling hills in large glaciated valleys	323 Douglas-fir/pinegrass-pinegrass phase
2	13UB Stream and outwash terraces	620 Subalpine fir/queencup beadlily
3	460A Glacial valley trains, gently sloping	692 Subalpine fir/beargrass dwarf whortleberry phase
4	40QA Glacial cirque headwalls and alpine ridges	501 Rough fescue – bluebunch wheatgrass
5	10UC Cool alluvial stream bottoms	691 Subalpine fir/beargrass huckleberry phase
6	13UB Stream and outwash terraces	650 Subalpine fir/bluejoint
7	47OA Glacial valley trains, moderately sloping	691 Subalpine fir/beargrass huckleberry phase

Plot No.	Land Type	Habitat Type
8	10UC Cool alluvial stream bottoms	692 Subalpine fir/beargrass dwarf whortleberry phase
9	46OA Glacial valley trains, gently sloping	670 Subalpine fir/menziesia
10	13UB Stream and outwash terraces	731 Subalpine fir/grouse whortleberry-pinegrass phase
11	10UB Stream bottoms with elevated water tables	651 Subalpine fir/bluejoint-bluejoint phase
12	13UB Stream and outwash terraces	731 Subalpine fir/grouse whortleberry-pinegrass phase
13	10UB Stream bottoms with elevated water tables	651 Subalpine fir/bluejoint-bluejoint phase
14	13UB Stream and outwash terraces	691 Subalpine fir/beargrass-huckleberry phase

HISTORICAL FIRE HISTORY

Understanding the past fire history provides a basis for assessing the impact of modern events. This information can be acquired through fire history studies or from observations made by individuals prior to the time of settlement. Fortunately both types of information are available for the Canyon Creek Fire. After the establishment of the Lewis and Clarke Reserve in 1897, H.B. Ayres was given the task of surveying the new reserve (1900). He spent 4 months in the reserve in 1899 conducting his survey. As part of this effort he developed a map which shows areas that had been burned during the past 40 years that had not recovered to any great degree. Ayres classified about 175 square miles or 73 percent of the present Scapegoat Wilderness as recently burned. Most of this burn occurred in 1889 some of which was a reburn of an older event. He states that all the burns were severe with very few live trees remaining and frequently they had a network of fallen trees with some dead standing trees. Reproduction was good along the edge of the burn but less abundant away from the unburned stands. Based on his maps the major area that was missed by the 1889 fire was in the vicinity of Carmichael Cabin extending up Debroda Creek to Evans Peak and into Tobacco Valley and the area south of the North Fork. While this area may have been missed by a stand replacement burn, numerous fire scars from the 1889 period can be found in the area. This evidence suggests that these areas were underburned and probably most of the Lolo Forest portion of the Scapegoat was within the 1889 fire area. Ayres showed two other areas around Lake Mountain and Concord Mountain as containing at least a scattered forest condition.

A detailed fire history investigation was conducted in the Danaher Meadows of the Bob Marshall Wilderness by Gabriel in 1976 (1976). While this study is outside the area investigated in the Canyon Creek Fire, the vegetation structure is very similar. Results of this study suggest that there was a large fire somewhere in the Danaher drainage each decade of the 19th Century. Based on the origin dates of the older stands he felt that a similar fire regime was experienced during the 18th Century. Gabriel concluded the 1809, 1844-47 and 1889 were years when fire changed the species and age composition of extensive forest areas. Fires in 1854-59, 1895 and 1910 probably had similar effects but on a smaller scale.

TABLE 2 – FIRE DATES FOR DANAHER BASIN AND CANYON CREEK FIRE AREA

<u>Danaher</u>	North Fork		Vegetation Plots	
	<u>Cabin Tree</u>	<u>N. Fork</u>	<u>Dry Fork</u>	<u>Carmichael Cabin</u>
1684				
	1704			
1709				
1714				
1729	1728			
1749	1750	1749		
1759	1758	1758		
1763	1763			
1782-85				
1803	1803		1803	
1809				
1819			1822	
1824-28	1824			1825-28
1835	1835	1835	1833	
1844-47	1848			
1854-59	1853+	1858		
	1860?			
1874	1873			
1889-91	1889	1889	1889	1889
1895-97				
1900				
1904				
1909-11				
1914				
1916				
1919-21				
1926		1926		
1930				
1937	1936			
1939				
1944				
	1952	1951		

Fire scars were noted on each plot along with the establishment date of the stand. These dates provide a check of the Danaher fire chronology and are shown in Table 2. In addition a large old Douglas-fir with numerous fire scars was found in the vicinity of North Fork Cabin. This tree had been dead for a number of years and rot had destroyed a portion of the fire scar record particularly between 1750 and 1835 and prior to 1700. This tree probably had its origin about 1500.

As can be seen from Table 2 there is a strong similarity between the Danaher Basin and the fires recorded on the Douglas-fir near North Fork Cabin. Actual dates may be off 2 years or more as a result of the poor condition and heavy pitch present in the Douglas-fir. Additionally the exact date of death could not be determined because of sap rot. Because of the susceptibility of lodgepole pine to fire mortality and the frequent stand replacement fires few fire scars survived for comparison in most of the Canyon Creek Fire. Those scars present however do match up with events documented in the Danaher chronology. Of interest is the complete lack of scars between 1889 and 1926 in the Canyon Creek Fire area and a steady fire occurrence in the Danaher area. There is no apparent reason for this shift and may be the result of an incomplete assessment of the Scapegoat area. Fires with widespread impact occurred in 1824-28 and 1889 within the Canyon Creek Fire. Fires which affected portions of the burn occurred in 1750, 1758, 1803, 1835, and 1853-58.

Based on this data for the period between 1704 and 1940 a fire of at least light intensity occurred every 16 years, a major burn every 34 years and a large all encompassing burn every 118 years. Adding data from 1940 until 1988 does not change these intervals appreciably with at least a light intensity burn every 17 years a major burn every 36 years and an all encompassing burn every 95 years.

CANYON CREEK FIRE BURN PATTERN

An analysis of the Lolo portion of the Canyon Creek Fire was undertaken to determine the intensity of the fire. Following the fire aerial photographs were taken of the fire area. These photos were evaluated and assigned a burn condition. There was a total of 73,654 acres within the fire boundary on the Lolo Forest. Of that 12,654 acres (17.2 percent) was unburned, 18,594 acres (25.2 percent) were partially burned and 42,406 acres (57.6 percent) were severely burned. Table 3 provides a breakdown by drainage and compartment of the burn intensity.

TABLE 3 – BURN ACRES FOR THE LOLO PORTION OF THE CANYON CREEK FIRE BY COMPARTMENT

Compartment Number	Drainage	Compartment Acres*	Comp. Acres within fire bdy.**	Unburned Acres@	%	Partial Burn Acres	%	Severe Burn Acres	%	Total Burn Acres	%#
639	Conger-Canyon	10119	2308	415	18%	1230	53%	663	29%	1893	19%
640	West Side-Dry	8744	1582	287	18%	373	24%	922	58%	1295	15%
641	North Fork-Blackfoot	11745	3506	486	14%	1952	56%	1068	30%	3020	26%
642	West Side-Cabin	5237	3783	308	8%	1913	49%	1562	40%	3475	66%
643	East Side-Cabin	8109	8109	2203	27%	806	10%	5100	63%	5906	73%
644	Lower Dry Fork	4870	4870	453	9%	1961	40%	2456	50%	4417	91%
645	East Side Lake	5665	5665	0	0%	130	2%	5535	98%	5665	100%
646	West Side Lake	7979	4435	332	7%	280	6%	3823	86%	4103	51%
647	McCabe	5666	12	0	0%	12	100%	0	0%	12	T
648	Dick	4400	40	27	67%	13	33%	0	0%	13	T
649	Lower North Fork-Black Foot	10414	9267	0	0%	744	8%	8523	92%	9267	89%
650	West Side North Fork	4158	4158	674	16%	2307	55%	1177	28%	3484	84%
651	Debrota-Tobacco Valley	11216	11216	3252	29%	2874	26%	5090	45%	7964	71%
652	East Side Blackfoot	11073	11006	4032	36%	2799	25%	4175	38%	6974	63%
653	McDermott-Cooper Lake	8951	3697	185	5%	1200	32%	2312	63%	3512	39%
Grand Total			73654	12654	17.2%	18594	25.2%	42406	57.6%	61000	82.8%

* Total Compartment acres

** Compartment acres within the fire boundary

@ Acres of the compartment within the fire boundary unburned

Percent of the total compartment that was burned

FIELD STUDY

Methods

Vegetation Plots – Following the Canyon Creek Fire attempts were made to initiate studies with various cooperators to take advantage of the first major natural fire which was allowed to burn basically unchecked at the landscape level. Unfortunately funding was not available so a much smaller undertaking was initiated by the Lolo Forest to track vegetative response over time. A series of vegetation plots were established on the Lolo Forest portion of the burn. Plots were located to sample various habitat types and burn intensities. Their number and location however was determined by trail accessibility and the number that could be established during a one-week period in October of 1988. The initial plot consisted of a 1/10-acre plot which listed the 12 most abundant species. In all cases there were less than 12 species remaining on the plots so it represented a complete listing of species present. A base line 66 feet in length was established at each plot from which 5 randomly located transects 50 feet in length were established. 50 points were sampled along each transect to determine ground cover and this data is summarized in Table 4. General plot information was collected to show physical features of the landscape. During the 1989 and subsequent sampling periods all species on the 1/10-acre plot were recorded and their cover estimated. Two additional plots were also established to sample an aspen clone recovery and a spruce bottom. No plots were established in the upper elevation types because of the lack of reasonable access. Plots were resampled in 1990, 1991 and 1993. 1989 through 1991 were sampled in the late July early August time frame and 1993 was sampled in September. Plot data was summarized and analyzed using the programs available through the ECOPAC program. Major items that were evaluated were ground surface conditions and species presence and coverage. Species identification followed Hitchcock & Cronquist (1973).

Photo Points – Photographs were taken at each plot to portray vegetative conditions and aid in locating the plot in subsequent years. A series of 23 photo points in addition to the vegetative plots were located to track vegetative recovery over time. From one to five photos were taken at each point. A total of 109 views were taken between the photo points and vegetative plots. Two additional vegetation plots were established during the 1989 field season which added 6 more views giving a total of 115 views that have been monitored through 1993.

TABLE 4 – PERCENT GROUND COVER AND BURN INTENSITY IN 1988 FOR PLOTS IN THE CANYON CREEK FIRE

ATTRIBUTE	PLOT NUMBER											
	1	2	3	4	5	6	7	8	9	10	11	12
White Ash	46.4	59.6	9.2	0.0	15.6	12.0	0.0	1.2	49.2	12.8	10.4	0.8
Black Ash	11.2	16.0	16.4	0.4	58.4	18.4	0.0	3.6	18.8	18.4	2.4	3.2
Charred Litter	28.8	7.2	54.0	59.2	16.0	54.8	89.6	84.8	9.6	55.2	78.0	46.4
Charred Wood	11.2	6.2	10.0	0.0	7.6	11.2	0.0	4.0	7.6	12.8	9.2	4.0
Litter	0.0	0.0	7.6	22.4	0.0	0.0	7.6	4.8	0.0	0.0	0.0	32.4
Wood	0.0	0.0	0.0	0.0	0.0	0.4	0.8	1.2	0.0	0.0	0.0	0.4
Gravel	0.4	2.0	0.4	6.0	1.2	0.0	0.0	0.0	1.2	0.8	0.0	0.8
Rock	0.4	8.4	0.8	0.0	0.0	3.2	0.0	0.0	12.4	0.0	0.0	0.0
Bare Ground	1.6	0.4	0.8	11.6	1.2	0.0	0.0	0.4	0.0	0.0	0.0	0.8
Basal Vegetation	0.0	0.0	0.8	0.0	0.0	0.0	1.6	0.4	0.0	0.0	0.0	1.2
Moss	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
Percent Ground Cover Burned	97	100	95	66	100	100	80	80	100	99	99	50
Burn Intensity	S	S	M	M	S	M	M	M	S	M	M	M

S = Severe Burn

M= Moderate Burn

RESULTS

Burn Intensity – Table 5 provides a breakdown of the ground cover conditions on each plot following the burn. Based on the amount of white and black ash, plots were categorized by burn intensity. Table 6 provides a tabulation of vegetative change by burn intensity through the 1993 evaluation. Plots 4 and 11 were not included since they were not in forested types. Plots 13 and 14 were categorized as severe based on an evaluation of the 1989 establishment data.

Areas categorized as severe burn sites had at least 15 percent or more ground cover of white ash. At least 57 percent of the ground was occupied by white or black ash. More than 99 percent of the ground cover was burned and only a trace of basal vegetation remained on the plots after the fire. Sites that are listed as light-moderate burn had a maximum of 13 percent white ash with a maximum of 33 percent total ash. Some vegetation remained alive after the fire with an average of 16 percent of the ground cover unburned.

As expected there are differences in recovery rates between the severe and moderate burn sites. 1989 surveys show four times more bare ground on the severely burned sites and while vegetative recovery was good on all sites there was still more than two times more bare ground in 1993 on the severe burn sites. This difference also occurred in percent of basal vegetation which showed twice as much in the lighter burn areas in 1989 however this difference had dropped to 8 percent in 1993. Litter followed a similar course starting as five times more coverage in the lighter burn in 1989 which has dropped to 27 percent by 1993.

Table 5 – Recovery of Ground Cover in the Canyon Creek Fire

Attribute	Percent Cover by Burn Intensity							
	Severe Burn				Moderate Burn			
	1989	1990	1991	1993	1989	1990	1991	1993
Bare Ground &								
Gravel	47.2	23.0	13.8	10.8	10.8	5.5	3.0	4.8
Rock	3.3	5.3	2.7	10.4	1.8	0.5	2.7	5.2
Organic Cover	24.0	63.7	85.3	102.0	68.0	89.0	97.5	164.0
Basal Vegetation	1.5	2.7	7.7	6.0	2.2	6.5	10.5	6.5
Woody Cover	10.5	8.3	7.7	7.2	4.2	5.0	4.3	7.8
Litter Cover	11.0	38.3	53.3	20.0	58.7	70.0	73.3	25.5

Vegetative Recovery – Total vegetative coverage averaged 31 percent for the severe burn sites in 1989 with the lowest reading being 12 percent. For the lighter burn sites the average coverage was 60 percent with a low of 38 percent. By 1993 the severely burned sites averaged almost 164 percent coverage with a low of 77 percent and the moderate burn averaged about 285 percent with a low of 187 percent. When evaluating the need to do rehabilitation on burned areas a guide of 50 percent coverage in 5 years is considered

satisfactory response and no treatment is needed. It is obvious from this sample that even the slowest areas to recover are well under this threshold.

Table 6 – Changes in Coverage for Major Species Under Various Burn Intensities

Species	Percent Cover by Burn Intensity							
	Severe Burn				Moderate Burn			
	1989	1990	1991	1993	1989	1990	1991	1993
SHRUBS								
*Amealn	0.0	0.0	0.2	0.3	0.1	0.2	0.6	0.5
Berrep	0.2	0.2	0.7	5.3	0.3	0.3	1.6	5.0
Ceavel	0.1	0.1	0.1	0.5	0.1	0.1	0.5	0.5
Ribes spp.	0.1	0.5	0.9	2.0	0.2	0.3	0.2	0.2
Spibet	2.3	4.4	9.3	7.5	0.8	0.3	3.6	1.0
Vacglo	0.2	0.1	0.1	3.5	3.6	3.6	13.9	35.0
Total Shrubs	4.7	7.0	15.8	33.7	7.3	6.9	18.8	58.7
GRAMINOIDS								
Calrub	2.3	2.3	1.1	8.7	12.7	12.2	17.2	31.7
Cargey	0.2	0.2	0.2	5.5	0.8	4.0	4.4	19.0
Carros	0.0	0.7	0.8	1.2	0.0	0.5	0.2	0.2
Total Graminoids	5.4	6.2	8.1	39.7	17.5	25.5	33.3	85.0
FORBS								
Arnica spp.	3.3	5.4	7.9	11.5	4.3	5.6	7.2	8.8
Astcon	1.2	1.2	2.3	6.3	2.3	0.6	1.1	7.2
Circium spp.	0.1	0.2	0.3	0.5	0.2	0.2	0.2	0.2
Epiang	6.6	37.2	40.0	36.3	0.9	5.0	12.3	22.2
Fragaria	0.2	0.8	1.1	3.8	2.4	4.1	10.8	12.3
Gerbic	0.1	1.1	0.0	0.2	0.0	0.1	0.0	0.5
Gervis	0.3	0.1	0.1	0.0	0.2	0.2	2.5	2.2
Lupser	0.0	0.0	0.0	0.0	3.5	1.8	1.8	10.2
Taroff	0.2	0.3	0.4	2.5	0.2	0.2	0.3	0.8
Xerten	0.7	0.2	0.2	2.0	7.2	2.3	5.2	14.3
Total Forb	17.6	53.0	59.4	90.2	28.3	27.9	53.3	141.5
Total Cover	31.0	76.2	90.0	163.6	59.8	68.6	113.7	285.2

*See Table 9 for scientific and common names of the species.

An attempt was made to relate species recovery to burn intensity or site potential. While differences were present, sample size limited the conclusions that could be drawn from the data. One of the most obvious findings of the study was the documentation of the second year flowering event. Forbs and grasses alike had a profusion of flowers. While flowering was common the third year it was considerably less than the previous year. Following are some observations on the various vegetative components.

Shrubs – Generally shrub coverage did not respond until 1991 in the forested environments. There was about two times more shrub coverage on the moderate burn sites in 1989 as compared to severely burned sites but by 1991 this difference was largely gone. Huckleberry and kinnikinnick were adversely impacted by a severe burn and markedly reduced its coverage. Spirea and Oregon grape on the other hand responded readily. Spirea did better on the severe burn sites and on dry environments and Oregon grape had more coverage on the moderate burn sites on dry environments. Ceanothus was found on the warmer sites particularly on the lower portion of the North Fork drainage.

Shrub response in the willow bottom was significantly better. Shrubs had coverage of 22 percent and averaged 1.3 feet tall in 1989. Coverage increased to 40 percent in 1990 and 50 percent in 1991 and averaged almost 3 feet tall. By 1993 shrubs had increased to 154 percent and averaged 4.3 feet tall. The willow component averaged about 7 feet. Unburned portions contain shrubs that average 8 feet and have formed very dense stands. Willow composition of the burned area is the same as prior to the burn as all plants noted were sprouts from root masses present at the time of the burn. The fire made the willow sprouts available for wildlife species by reducing sprout height and eliminating the deadwood common in the unburned portion.

Graminoids – Pinegrass and elk sedge play a major coverage role in the dry lodgepole pine stands particularly on the moderate burn sites. Initial coverage of pinegrass was high and did not change much by 1991 however there was an increase of about 2 ½ times (31.7%) by 1993. Elk sedge on the other hand was limited in 1989 and increased markedly by 1993 to 19 percent. Ross's sedge appears to have increased on the severe burned dry lodgepole types.

The dry bunch grass type found in Plot 4 experienced a light burn as a result of the typically low fuel loadings. By 1993 it was difficult to detect any signs of the burn and the stand density appeared to be approaching preburn conditions. Grass coverage increased 37 percent between 1989 and 1991 and by 1993 had increased over 300 percent to 162 percent. Forbs increased about 80 percent between 1989 and 1991 and increased to 106 percent (333 percent) by 1993. It appears that the fire had more direct impact on the forbs component compared to the graminoids initially but most of this difference was gone by 1993.

Forbs – Arnica, showy aster, fireweed and strawberry occupied most of the coverage in the forb layer. Fireweed had significantly more coverage in the severe burn sites and was the only plant in the understory found in all 14 plots. It averaged almost 2 feet in height over the plots with some sites over 4 feet tall. Four other species of fireweed were present on the burn and although common they did not provide much coverage because of their small size.

Unique Species – Two special situations were noted during the first three years of the burn. One was the mushroom bloom that occurred in 1989, one year after the burn.

Unfortunately no sampling was undertaken to determine if site or burn severity was related to the bloom. The bloom was completely gone by 1990 with none observed during that field season.

The second was the occurrence of Bicknell's geranium. Some vegetative plants were found during the 1989 sampling period followed by a major flowering event during 1990. It appeared to be more common on the moister sites although data was limited. By 1991 no plants were found on the plots and less than ½ dozen were noted during the two week sample period. These two species apparently will lie dormant until the next major fire.

Weed Species – Of particular concern to many people was the potential for introduction of weedy species into the burn area. It was felt that the severity of the burn could result in a major invasion of noxious plants. No noxious plants were found on any of the plots during the study. Noxious weeds were found in the burn but were all associated with the North Fork Trail or disturbance around the North Fork Cabin and the old cabin site at Smoke's Bridge. Approximately 6 spotted knapweed (*Centaurea maculosa*) plants were pulled at Smoke's Bridge in 1991. A few plants were also pulled at the North Fork Cabin. A clump of tansy (*Tanacetum vulgare*) was pulled at the North Fork Cabin in 1990 and sulfur cinquefoil (*Potentilla recta*) was found along the trail from the trail head to about the Wilderness boundary in 1991.

A number of exotic plants were found however on the plots. These are normally the barnyard variety and associated with the horse use in the Wilderness. Other plants such as dandelion, yellow salsify, common thistle, and filago were probably windblown as they were found on plots isolated from the main trails. Nine species were found in 1989, 17 in 1990, 13 in 1991 and 11 in 1993. This trend suggests that the species that are present probably will be the only ones of concern. It is unclear if these species are expanding their range or not. Since all of the species were found only in trace amounts it is possible that on a particular plot a species could be overlooked from one year to the next. Recognizing this caution some changes may be occurring. Dandelion was found on 10 plots in 1993 a 66% increase from 1989 however this was the same number as 1991. Timothy has increased from one plot in 1989 to 6 plots in 1993 showing a continuing increase in its presence. Kentucky bluegrass has followed a similar pattern increasing from 1 plot in 1989 to 5 plots in 1993. Filago has shown the opposite trend dropping from a high of 7 plots in 1990 to 2 in 1993. Of the remaining 15 species, 8 were not found on the plots in 1993 with the remaining 7 showing no or minor change in the number of plots impacted.

TABLE 8 – EXOTIC SPECIES INVENTORIED IN THE CANYON CREEK FIRE

Species	Common Name	Number of Plots Present			
		89	90	91	93
Graminoids					
Agropyron caninum	slender wheatgrass	1	2	1	2
Agrostis tenuis	colonial bentgrass	0	0	1	0
Dactylla glomerata	orchard-grass	0	1	1	1
Lolium multiflorum	perennial ryegrass	0	1	0	0
Phleum pratense	common timothy	1	3	4	6
Poa pratensis	Kentucky bluegrass	1	3	4	5
Forbs					
Arabis glabra	tower mustard	0	1	1	1
Arenaria capillaries	fescue sandwort	1	2	2	0
Brassica nigra	black mustard	0	1	0	0
Carduus nutans	musk thistle	0	1	0	0
Chenopodium	lambquarter	1	1	0	0
Chenopodium capitatum	strawberry blite goosefoot	0	1	0	0
Cirsium vulgare	bull thistle	3	4	4	3
Filago arvensia	field filago	4	7	5	2
Melilotus officinalis	yellow sweet-clover	0	1	1	0
Taraxacum officinale	common dandelion	6	8	10	10
Tragopogon dubius	yellow salsify	0	2	3	2
Trifolium repens	white clover	2	2	1	1
Trifloium spp.	clover	0	1	1	2

Tree Regeneration – A series of 1/300 acre plots were taken in association with the vegetation plots to measure tree recovery. Only 12 of the vegetative plots were included in this study as the remaining two are not forest types. Tree regeneration was found on 10 of the 12 (83 percent) plots the first year following the fire. Plot 13 near the fire origin was unstocked and plot 12 had seedlings present but they were survivors of the fire rather than new seedlings. Lodgepole pine was the major species occurring on all 10 plots. Douglas-fir was found on two plots, and spruce and aspen on one. In 1990 aspen was found on 2 additional plots and by 1991 had expanded to 5 plots. The 1993 sample found aspen only on plot 14 which represented the aspen clone. While seedling aspen were found outside of aspen clones in 1991 site conditions apparently were not suitable and only occasional individuals were noted in 1993 with none found on any of the tree regeneration plots. On plot 14 which contained an aspen clone a total of 79 aspen were counted which represents 592 trees on the 1/10 acre plot. Occasional subalpine fir were noted but none found on the plots in 1993. By 1993 an average of 2078 trees per acre were counted on the plots excluding aspen. This number varied from plots with no trees to over 13,000 per acre. Lodgepole pine was the major species averaging over 2,000 per

acre. Minor amounts of Douglas fir (38 per acre) and spruce (15 per acre) were also found.

TABLE 9 – SPECIES LIST FOR THE CANYON CREEK FIRE

Abbreviation	Species	Common Name	Number of Plots Present			
			89	90	91	93
TREES						
Abilas	Abies lasiocarpa	subalpine fir	1	3	2	4
Larocc	Larix occidentalis	western larch	0	0	1	0
Piceng	Picea engelmannii	Engelman spruce	3	2	3	5
Pincon	Pinus contorta	lodgepole pine	10	10	9	12
Poptre	Populus tremuloides	aspen	1	4	5	3
Psemen	Pseudotsuga menziesii	Douglas-fir	4	4	3	6
TOTAL TREE SPECIES			5	5	6	6
SHRUBS						
Acegla	Acer glabrum	Rocky Mtn. Maple	1	0	2	2
Alninc	Alnus incana	thinleaf alder	2	1	1	1
Alnsin	Alnus sinuata	Sitka alder	1	1	1	2
Amealn	Amelanchier alnifolia	serviceberry	2	3	6	6
Arcuva	Arctostaphylos uva-ursi	kinnikinnick	4	4	4	4
Artemi	Artemisia spp.	sagebrush	0	0	1	0
Berrep	Berberis repens	Oregon grape	8	8	8	8
Betgla	Betula glandulose	bog birch	0	1	1	1
Ceavel	Ceanothus velutinus	ceanothus	2	2	2	2
Chiumb	Chimaphila umbellata	Prince's-pine	0	0	0	3
Clemat	Clematis spp.	clematis	1	0	0	0
Juncom	Juniperus communis	common juniper	1	2	2	2
Ledgla	Ledum glandulosum	Labrador-tea	1	1	1	1
Linbor	Linnaea borealis	twin flower	0	1	1	1
Loninv	Lonicera involucrata	bearberry	3	3	3	3
Lonuta	Lonicera utahensis	Utah honeysuckle	5	3	3	4
Menfer	Menziesia ferruginea	fool's huckleberry	1	3	2	1
Pacmyr	Pachistima myrainites	pachistima	0	4	4	4
Phyemp	Phyllodoce empetriformia	red mountain-heath	0	0	1	1
Phymal	Physocarpus malvaceus	ninebark	0	0	0	1
Potfru	Potentilla fruticosa	shrubby cinquefoil	1	1	2	1
Ribesx	Ribes spp.	Ribes	4	9	7	6
Riblac	Ribes lacustre	western currant	0	1	2	3
Ribvis	Ribes viscosissimum	sticky currant	0	1	2	5
Rosaci	Rosa acicularis	prickly rose	0	0	5	3
Rosaxx	Rosa spp.	rose	7	3	1	2
Rosgym	Rosa gymnocarpa	baldhip rose	0	2	0	1
Rosnut	Rosa nutkana	nootka rose	0	0	1	0
Rubida	Rubus idaeus	red raspberry	0	2	2	1

Abbreviation	Species	Common Name	Number of Plots Present			
			89	90	91	93
SHRUBS CONT.						
Rubpar	Rubus parviflorus	thimbleberry	4	1	2	2
Salboo	Salix boothii	blueberry willow	1	1	1	2
Saldru	Salix drummondiana	Drummond willow	1	2	2	3
Sallut	Salix lutea	yellow willow	0	1	2	0
Salpla	Salix planifolia	planeleaf willow	0	0	0	1
Salixx	Salix spp.	Willow	1	1	1	2
Shecan	Shepherdia Canadensis	buffaloberry	1	4	4	6
Spibet	Spiraea betulifolia	spirea	8	8	8	8
Symalb	Symphoricarpos albus	snowberry	2	3	5	5
Vaccae	Vaccinium caespitosum	dwarf huckleberry	0	0	0	1
Vacglo	Vaccinium globulare	globe huckleberry	5	2	2	3
Vacsco	Vaccinium scoparium	grouse whortleberry	7	6	6	7
Shrubx	unknown	unknown shrub	0	0	0	1
TOTAL SHRUB SPECIES			27	31	35	38

GRAMINOIDS

Agrcan	Agropyron caninum	slender wheatgrass	1	2	1	2
Agrcri	Agropyron cristatum	crested wheatgrass	1	0	0	0
Agrscr	Agropyron scribneri	spreading wheatgrass	1	0	0	0
Agrspi	Agropyron spicatum	bluebunch wheatgrass	1	1	1	1
Agrexa	Agrostis exarata	spike bentgrass	0	0	0	3
Agrsca	Agrostis scabra	rough bentgrass	1	3	2	1
Agrost	Agrostis spp.	bentgrass	0	0	1	0
Agrten	Agrostis tenuis	colonial bentgrass	0	0	1	0
Broano	Bromus anomalus	nodding brome	0	1	1	0
Brocil	Bromus ciliates	fringed brome	0	0	0	1
Broine	Bromus inermis	smooth brome	0	0	0	1
Brovul	Bromus vulgaris	Columbia brome	3	3	2	0
Bromus	Bromus spp.	brome	0	0	0	2
Calcan	Calamagrostis Canadensis	bluejoint	2	4	5	4
Calrub	Calamagrostis rubescens	pinegrass	11	10	8	9
Cararc	Carex arcta	northern clustered sedge	0	2	2	0
Caurar	Carex aurea	golden sedge	0	0	1	0
Carcan	Carex canescens	gray sedge	0	0	0	1
Carcoi	Carex concinna	northern sedge	6	9	10	9
Cardew	Carex deweyana	Dewey's sedge	0	1	1	1
Cargey	Carex geyeri	elk sedge	8	7	7	11
Carmer	Carex mertensii	Mertens' sedge	0	0	0	1
Carmic	Carex microptera	smallwinged sedge	0	0	1	3
Carpet	Carex petasata	Liddon's sedge	0	0	0	1
Carros	Carex rossii	Ross sedge	0	5	6	5
Carex	Carex spp.	sedge	1	3	1	0
Dacglo	Dactylla glomerata	orchard-grass	0	1	1	1

Abbreviation	Species	Common Name	Number of Plots Present			
			89	90	91	93
GRAMINOIDS CONT.						
Danint	Danthonia intermedia	timber danthonia	0	4	1	2
Danuni	Danthonia unispicata	one-spike danthonia	0	0	1	0
Deselo	Dechampsia elongate	slender hair-grass	0	0	1	1
Elycan	Elymus Canadensis	Canada wildrye	1	2	1	0
Elygla	Elymus glaucus	blue wildrye	0	0	0	1
Fesida	Festuca idahoensis	Idaho fescue	3	3	3	3
Fesocc	Festuca occidentalis	western fescue	0	2	2	0
Fesrub	Festuca rubra	red fescue	0	0	2	2
Fessca	Festuca scabrella	rough fescue	1	3	2	3
Grass	Grass spp.	grass	3	0	0	3
Junmer	Juncus mertensianus	Merten's rush	0	1	1	0
Junreg	Juncus regelii	Regal's rush	0	0	1	1
Juncus	Juncus spp.	rush	0	1	0	0
Koecri	Koeleria cristata	Junegrass	1	1	1	1
Lolmul	Lolium multiflorum	perennial ryegrass	0	1	0	0
Luzpar	Luzula pariviflora	small-flowered luzula	0	1	1	1
Phlalp	Phleum alpinum	alpine timothy	0	2	1	0
Phlpra	Phleum pretense	common timothy	1	3	4	7
Poacus	Poa cusickii	Cusick's bluegrass	0	1	1	0
Poaint	Poa interior	inland bluegrass	0	0	1	0
Poapra	Poa pratensis	Kentucky bluegrass	1	3	4	3
Pucpau	Puccinellia pauciflora	weak alkaligrass	0	0	1	1
Sithys	Sitanion hystrix	squirreltail	0	0	0	1
Stinel	Stipa nelsonii	Nelson's needlegrass	0	1	1	0
Stiocc	Stipa occidentalis	western needlegrass	1	2	1	2
Sticol	Stipa Columbiana	subalpine needlegrass	0	0	0	1
Stiric	Stipa richardsonii	Richardson's needlegrass	1	1	1	0
Trican	Trisetum canescens	tall trisetum	0	2	1	0
Trispi	Trisetum spicatum	spike trisetum	0	2	2	2
TOTAL GRAMINOID SPECIES			20	33	41	35

FORBS

Achmil	Achillea millefolium	yarrow	5	7	8	8
Agaurt	Agastache urticifolia	giant-hyssop	1	0	0	0
Agoaur	Agoseris aurantiaca	orange agoseris	2	3	3	3
Agogla	Agoseris glauca	pale agoseris	0	1	1	0
Allcer	Allium cernuum	nodding onion	1	4	4	2
Anamar	Anaphalia margaritacea	pearly-everlasting	0	3	4	11
Anemul	Anemone multifida	cliff anemone	1	2	2	1
Angarg	Angelica arguta	sharptooth angelica	0	2	2	1
Antana	Antennaria anaphaloides	tall pussytoes	1	1	1	0
Antmic	Antennaria microphylla	rosy pussytoes	1	2	4	3
Antrac	Antennaria racemosa	raceme pussytoes	2	2	3	4

Abbreviation	Species	Common Name	Number of Plots Present			
			89	90	91	93
FORBS CONT.						
Antenn	Antennaria spp.	pussytoes	1	2	0	0
Antumb	Antennaria umbrinelia	umber pussytoes	1	2	2	0
Apoand	Apocynum androssemifolium	spreading dogbane	1	1	1	1
Aragla	Arabis glabra	towermustard	0	1	1	1
Arahol	Arabis holboellii	Holboell's rockcress	0	3	2	0
Arahir	Arabis hirsuta	hairy rockcress	0	0	0	1
Araspa	Arabis sparsiflora	sicklepod rockcress	0	1	1	0
Arecap	Arenaria capillaries	fescue sandwort	1	2	2	0
Aremac	Arenaria macrophylla	bigleaf sandwort	1	1	1	0
Arenar	Arenaria spp.	sandwort	0	0	0	1
Areser	Arenaria serpyllifolia	thymeleaf sandwort	2	0	0	0
Arncor	Arnica cordifloia	heartleaf arnica	3	4	5	2
Arnlat	Arnica latifolia	broadleaf arnica	8	8	9	8
Artlud	Artemisia ludoviciana	gray sagewort	0	0	0	1
Astcon	Aster conspicuous	showy aster	8	6	7	8
Astalp	Aster alpigenus	alpine aster	0	0	0	1
Asteat	Aster eatonii	Eaton's aster	0	1	1	0
Astcam	Aster campestris	western meadow aster	0	0	0	1
Astint	Aster integrifolius	thickstem aster	2	3	3	1
Astlae	Aster laevis	smooth aster	0	0	2	1
Astocc	Aster occidentalis	western aster	0	1	1	5
Asterx	Aster spp.	aster	0	1	2	2
Astalp	Astragalus alpines	alpine milkvetch	0	2	2	0
Astame	Astragalus americanus	American milkvetch	1	1	1	0
Astrag	Astragalus spp.	milkvetch	1	1	0	2
Astgra	Astragalus gracilis	slender milkvetch	1	0	0	0
Astrob	Astragalus robbinsii	Roger's milkvetch	0	1	0	0
Balsag	Balsamorhiza sgittata	arrowleaf balsamroot	1	1	0	0
Branig	Brassica nigra	black mustard	0	1	0	0
Caloch	Calochortus spp.	mariposa	0	1	1	0
Camqua	Camassia quamash	camas	1	0	0	0
Camrot	Campanula rotundifolia	lady's-thimble	4	3	4	5
Carnut	Carduus nutans	musk thistle	0	1	0	0
Caslut	Castilleja lutescens	yellowish paintbrush	1	1	1	1
Caspal	Castilleja pallescens	palish Indian-paintbrush	0	1	1	0
Casmin	Castilleja miniata	scarlet paintbrush	0	0	0	1
Cerarv	Cerastium arvense	field chickweed	1	0	0	1
Cerbee	Cerastium beeringianum	alpine chickweed	0	2	1	0
Cernut	Cerastium nutans	nodding chickweed	0	1	0	0
Cerast	Cerastium spp.	chickweed	0	1	0	0
Cervul	Cerastium vulgatum	common chickweed	0	1	0	1
Chealb	Chenopodium album	lambsquarter	1	1	0	0
Checap	Chenopodium capitatum	strawberry blite goosefoot	0	1	0	0

Abbreviation	Species	Common Name	Number of Plots Present			
			89	90	91	93
FORBS CONT.						
Chiumb	Chimaphilia umbellate	prince's-pine	0	2	2	0
Cirarv	Cirsium arvense	Canada thistle	0	0	0	2
Cirsiu	Cirsium spp.	thistle	3	5	4	2
Circan	Cirsium canovirens	gray-green thistle	0	0	0	1
Cirvul	Cirsium vulgare	bull thistle	3	4	4	0
Cirsca	Cirsium scariosum	elk thistle	0	0	0	2
Colpar	Collinsia parviflora	blue-eyed Mary	2	6	3	0
Collom	Collomia spp.	collomia	0	0	1	0
Coltin	Collomia tinctoria	yellow-staining collomia	0	0	1	0
Creacu	Crepis acuminata	tapertip hawksbeard	0	1	0	0
Creatr	Crepis atribarba	slender hawksbeard	0	1	0	0
Drapar	Dracocephalum parviflorum	American dragonhead	0	5	1	0
Epiang	Epilobium angustifolium	fireweed	14	14	14	13
Epicil	Epilobium ciliatum	autumn willow-herb	0	1	0	0
Epigla	Epilobium glandulosum	common willow-herb	4	5	6	0
Epimin	Epilobium minutum	small-flowered willow-h	3	2	6	1
Epipal	Epilobium palustre	swamp willow-herb	1	0	0	0
Epipan	Epilobium paniculatum	tall annual willow-herb	2	7	8	3
Epiwat	Epilobium watsonii	Watson's willow-herb	4	5	3	4
Erispe	Erigeron speciosus	showy fleabane	3	1	0	2
Eriumb	Eriogonum umbellatum	sulfur buckwheat	2	2	2	1
Erygra	Erythronium grandiflorum	glacier-lily	0	1	1	1
Filarv	Filago arvensia	field filago	4	7	5	2
Forb	unknown	perennial forb	3	2	0	1
Forb	unknown	forb	6	4	0	8
Fraspe	Frasera speciosa	giant frasera	0	0	0	1
Fraves	Fragaria vesca	woods strawberry	0	1	1	0
Fravir	Fragaria virginiana	Virginia strawberry	9	9	9	9
Friatr	Fritillaria atropurpurea	checker lily	1	0	0	0
Galbor	Gallium boreale	northern bedstraw	5	6	6	4
Galtri	Gallium triflorum	sweetscented bedstraw	0	1	1	3
Gencal	Gentiana calycosa	explorer's gentian	0	1	1	0
Genten	Gentiana tenella	slender gentian	0	0	0	1
Genama	Gentianeila amarelle	annual gentian	0	1	2	0
Gerbic	Geranium bicknailli	Bicknell's geranium	1	4	0	2
Gerani	Geranium spp.	geranium	1	0	0	0
Gervis	Geranium viscosissimum	sticky geranium	8	5	5	4
Geumac	Geum macrophyllum	larged-leaved avens	0	1	1	1
Geutri	Geum triflorum	old man's whiskers	1	1	1	1
Gooobl	Goodyera oblongifolia	western rattlesnake-p	0	0	0	1
Gnavis	Gnaphalium viscosum	sticky cudweed	0	4	4	0
Gnamic	Gnaphalium microcephalum	white cudweed	0	0	0	1
Habdil	Habenaria dilatata	white bog-orchid	1	1	1	1

Abbreviation	Species	Common Name	Number of Plots Present			
			89	90	91	93
FORBS CONT.						
Habsac	Habenaria saccata	slender bog-orchid	0	1	1	0
Habena	Habenaria spp.	bog-orchid	0	1	0	0
Habuna	Habenaria unalascensia	Alaska rein-orchid	0	1	1	0
Hacflo	Hackelia floribunda	many-flowered stickseed	0	0	0	1
Hacmic	Hackelia micrantha	blue stickseed	1	1	1	0
Hedocc	Hedysarum occidentale	western hedysarum	6	3	3	2
Herlan	Heraciaum lanatum	cow-parsnip	1	2	1	1
Heucyl	Heuchera cylindrical	roundleaf alumroot	0	0	1	0
Hieale	Hieracium albertinum	western hawkweed	3	4	4	5
Hiealb	Hieracium albiflorum	white hawkweed	6	5	5	0
Hiecyn	Hieracium cynoglossoides	hound's tongue h.	0	0	0	3
Iilriv	Iliamna rivularis	streambank globe-mallow	0	1	1	0
Lacser	Lactuca serriola	prickly lettuce	1	0	0	0
Linsep	Linanthus septentrionalis	northern linanthus	0	1	1	0
Litrud	Lithospermum ruderales	wayside gromwell	2	0	2	1
Lomcus	Lomatium cusickii	Cusick's lomatium	2	0	0	0
Lupser	Lupinus sericeus	silky lupine	4	4	4	4
Lycdru	Lychnia drummondii	Drummond campion	1	0	0	0
Mellin	Melampyrum lineare	narrow-leaved cow-wheat	0	1	1	1
Meloff	Melilotus officinalis	yellow sweet-clover	0	2	2	0
Micgra	Microsteria gracilis	pink microsteria	0	3	1	0
Mimlew	Mimulus lewisii	Lewis' monkey-flower	1	1	1	0
Mitbre	Mitella breweri	Brewer's miterwort	0	0	0	1
Mitpen	Mitella pentandra	five-stamened miterwort	0	1	1	1
Monnut	Monolepis nuttalliana	Nuttall's monolepis	0	1	0	0
Montia	Montia spp.	montia	1	0	0	0
Osmchi	Osmorhiza chilensis	mountain sweet-root	3	2	4	1
Osmdep	Osmorhiza depauperata	bluntseed sweet-root	0	1	1	0
Oxyser	Oxytropis sericea	silky crazyweed	0	0	0	1
Parfim	Parnassia fimbriata	fringed grass-of-parnass	1	1	1	1
Pedcon	Pedicularis contorta	coiled-beak lousewort	0	1	1	0
Pedgro	Pedicularis groenlandica	elephanthead	0	1	0	0
Pedrac	Pedicularis racemosa	sickle-top lousewort	1	1	1	2
Penalb	Penstemon albidus	white-flowered penst.	0	1	0	0
Penpro	Penstemon procerus	littleflower penstemon	3	4	3	3
Penste	Penstemon spp.	penstemon	0	0	2	2
Pergai	Perideridta gairdneri	Gairdner's yampah	0	1	1	2
Poldou	Polygonum douglasii	Douglas' knotweed	0	2	2	1
Potarg	Potentilla arguta	tall cinquefoil	3	3	3	0
Potgla	Potentilla glandulosa	varileaf cinquefoil	0	0	0	1
Potgra	Potentilla gracilis	northwest cinquefoil	2	1	2	3
Pyrell	Pyrola alliptica	white wintergreen	0	1	0	0
Pyrchl	Pyrola chlorantha	green wintergreen	0	2	1	0

Abbreviation	Species	Common Name	Number of Plots Present			
			89	90	91	93
FORBS CONT						
Pyrsec	Pyrola secunda	one-sided wintergreen	1	0	0	2
Pyrasa	Pyrola asarifloia	pink wintergreen	0	0	0	2
Pyrola	Pyrola spp.	wintergreen	0	0	0	2
Pyrmin	Pyrola minor	lesser wintergreen	0	0	0	1
Ranunc	Ranunculus spp.	buttercup	0	1	0	0
Rorcur	Rorippa curvipes	obtuse fieldcress	0	1	1	0
Rumace	Rumex acetoseila	sheep sorrel	0	0	1	0
Saxarg	Saxifraga arguta	brook saxifrage	1	1	1	1
Sedlan	Sedum lanceolatum	lance-leaved stonecrop	0	1	1	1
Sencan	Senecio canus	silvery groundsel	0	0	0	1
Senint	Senecio integerrimus	western groundsel	0	1	1	0
Seneci	Senecio spp.	groundsel	0	0	0	1
Senpse	Senecio pseud aureus	golden groundsel	0	4	5	3
Senser	Senecio serra	tall groundsel	0	1	1	0
Sentri	Senecio triangularis	arrowleaf groundsel	1	2	2	1
Smirac	Smilacina racemosa	false spikenard	0	0	1	0
Smiste	Smilacina stellata	starry Solomon-plume	3	3	1	1
Solida	Solidago spp.	goldenrod	0	1	1	0
Stelon	Stellaria longifloia	long-leaved starwort	0	0	0	1
Stramp	Streptopus amplexifolius	twisted-stalk	1	1	1	0
Taroff	Taraxacum afficinale	common dandelion	6	8	10	9
Thaocc	Thalictrum occidentale	western meadowrue	7	8	8	6
Tradub	Tragopogon dubius	yellow salsify	0	2	3	2
Trirep	Trifolium repens	white clover	2	2	1	0
Trihyb	Trifolium hybridum	alsike clover	0	0	0	2
Trifol	Trifolium spp.	clover	0	1	1	1
Valsit	Valeriana sitchensis	sitka valerian	1	1	1	0
Verame	Veronica americana	American speedwell	0	1	1	1
Vertha	Verbascum thapsus	common mullein	0	0	0	1
Verscu	Veronica scutellata	marsh speedwell	0	1	1	0
Verwor	Veronica wormskjoldii	Wormskjold speedwell	0	1	0	0
Violax	Violet spp.	violet	9	3	1	2
Vioorb	Violet orbiculata	round-leaved violet	0	2	2	2
Xerten	Xerophyllum tenax	beargrass	7	6	6	7
Zigven	Zigadenus venenosus	meadow death-camas	1	1	1	1
TOTAL FORB SPECIES			80	129	112	97
FERNS						
Equarv	Equisetum arvense	field horsetail	1	1	1	2
Equsyl	Equisetum sylvaticum	wood horsetail	1	1	1	0
Equvar	Equisetum variegatum	variegated horsetail	0	0	1	0
TOTAL FERN SPECIES			2	2	3	1
TOTAL SPECIES			134	200	197	177

CONCLUSIONS

1. Vegetative recovery is proceeding at a faster rate than anticipated. Plots contain at least 70% plant coverage in five years which is well above the satisfactory standard of 50% in 5 years.
2. Introduction of noxious weeds or exotic species has not been significant. Most species found were probably present before the fire. The number of exotic species present however is a matter of concern.
3. Tree regeneration after five years is adequate however some sites particularly the moist stream bottoms have limited reproduction. This condition was noted on other large fires such as Charlotte Peak in the Bob Marshall Wilderness and is due in part to the lack of lodgepole pine in the original stand. It can be expected that these sites may take 10 years or more to become adequately stocked.
4. Shrub response will probably become more apparent in the next 2 to 3 years.
5. The major flowering event that occurred in 1990 and to some extent in 1991 will probably decline.
6. Other than the appearance of Bicknell's geranium, species present after the fire were common before the burn.

REFERENCES

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